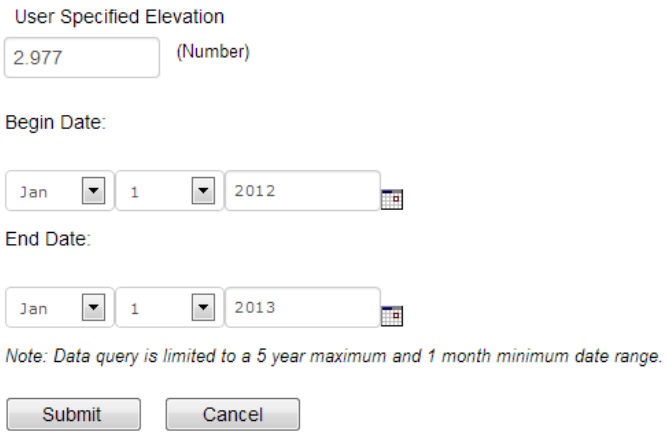
Case Study Charleston

Charleston Harbor and vicinity are served by a single tide gauge (#8665530), which reaches flood threshold at 7 feet mean lower low water (MLLW) (2.134 meters), as defined by the Charleston Weather Forecast Office.

Open the Inundation Analysis Tool, navigate to the Charleston, South Carolina, tide gauge, and click on the link in the pop-up box to access the tool for this location. There you'll see the datum-based water level information. Locate, but do not select, the value for the MLLW datum (0.843 meters).

○	MHHW	2.600	Mean Higher-High Water
○	MHW	2.491	Mean High Water
○	DTL	1.721	Mean Diurnal Tide Level
○	MTL	1.695	Mean Tide Level
○	MSL	1.733	Mean Sea Level
○	MLW	0.900	Mean Low Water
○	MLLW	0.843	Mean Lower-Low Water
○	NAVD	1.800	North American Vertical Datum

The National Weather Service (NWS) provided a flood threshold of 2.134 meters (7 feet) with the station MLLW datum of 0.843 meters for a total of 2.977 meters. The 2.977 meter MLLW can be thought of as the total water level used for flood advisories for this location. When this elevation is reached, or predicted to be reached, the NWS will issue a coastal flood advisory statement. Enter the value 2.977 into the User Specified Elevation number box. Select the begin date as Jan 1, 2012, and end date as Jan 1, 2013. Click Submit.



Inundation Analysis
8665530 Charleston, SC
From 2012-01-01 To 2013-01-01
Reference Datum = 2.977 Meters (User)
27 High Tides Analyzed 46.0 Total Hours Inundated

Notice that the results list each tide that exceeds the threshold, along with tide elevation, type, and individual duration. This information represents verified historical tide data.

To create scenarios of increased sea level rise, subtract 0.5 meters (0.5 meter sea level rise) from the 2.977 meters to get 2.477 meters. But why subtract? In the datum conversion world, going up—for example, from MLLW to mean higher high water (MHHW)—is negative, and going down—MHHW to MLLW—is positive, which is why you subtract the sea level rise value increment. With sea level rise, the whole base is shifting up while the flooding threshold stays the same, making the threshold a smaller number.

For further guidance, contact the staff at the NOAA Center for Operational Oceanographic Products and Services (CO-OPS). Re-running the Inundation Analysis Tool with 2.477 meters (half-meter sea level rise scenario) as the user-specified input, with the same time period dates, you should get the values shown below:

Inundation Analysis
8665530 Charleston, SC
From 2012-01-01 To 2013-01-01
Reference Datum = 2.477 Meters (User)
469 High Tides Analyzed 1344.5 Total Hours Inundated

See the increase to **469** high tides at flood stage and **56** total days of flooding.

Repeat the process by subtracting another 0.5 meters for the 1-meter sea level rise scenario. The user input should now be 1.977 meters and the dates the same. The results should mirror the information below:

Inundation Analysis
8665530 Charleston, SC
From 2012-01-01 To 2013-01-01
Reference Datum = 1.977 Meters (User)
697 High Tides Analyzed 3751.6 Total Hours Inundated

For Charleston, that would be **697** times for the 2012 calendar year with a total duration of **156 days**.

With rising sea levels, nuisance coastal flooding events will continue to increase in frequency, duration, and severity. In this Charleston example, a half-meter (1.6 feet) of sea level rise from current levels would have resulted in **469** "nuisance" flooding events last year, with flood thresholds breached for a total combined duration of **56** days. Take it up a notch to a one-meter rise (3.3 feet) in sea level, and Charleston would have experienced **697** events lasting a combined duration of **156** days.

With **697** tides at flood stage and **156** total days of flooding, this charming southern city quickly becomes Venice, Italy. Remember to keep in mind that these data do not factor in the compounding effects onshore flow, low pressure, or precipitation.